

Place of Death Among Malignant Brain Tumour Decedents in the United States, 2003–2024: A CDC WONDER Joinpoint Analysis of End-of-Life Care Settings with Relevance to Palliative Capacity in Pakistan

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Abstract

Objective: Palliative and hospice care are essential for patients with malignant brain tumours. Pakistan has limited hospice infrastructure and lacks a national end-of-life surveillance system. This study aimed to evaluate temporal trends in the place of death among malignant brain tumour decedents in the United States and provide a reproducible surveillance model applicable to palliative care planning in Pakistan.

Methods: A retrospective population-based ecological time-trend study was conducted using the CDC WONDER Underlying Cause of Death database for malignant brain tumour (ICD-10 C71) deaths from 2003 to 2024, on 29. June 2026.. Place of death was categorized into home, hospice, hospital inpatient, nursing home, and other settings. Bridged-race mortality files (2003–2020) and single-race files (2021–2024) were analyzed using Joinpoint regression. Annual Percent Change (APC), Average Annual Percent Change (AAPC), and 95% confidence intervals were calculated. Pairwise tests of parallelism and coincidence assessed differences in temporal trends across care settings. Reporting followed the STROBE guideline.

Results: A total of 335,318 malignant brain tumour deaths were analyzed. Home remained the most common place of death, increasing from 45.1% in 2003 to 53.3% in 2024 (AAPC +0.83%; 95% CI 0.15–1.52), with the steepest increase between 2018 and 2021 (APC +6.56%) before declining from 2021 to 2024 (APC –3.70%). Hospice deaths increased from 0.7% to 13.3%, with the greatest rise occurring between 2003 and 2006 (APC +99.18%). Conversely, hospital inpatient deaths decreased from 22.5% to 13.0% (APC –3.60% through 2021), while nursing home deaths declined from 21.4% to 14.2%. Fourteen of fifteen pairwise comparisons demonstrated significantly different temporal trajectories between care settings (parallelism p=0.0007; coincidence p=0.0002).

Conclusion: The place of death among United States malignant brain tumour decedents has shifted substantially from hospital-based to home- and hospice-based care over the past two decades. This population-level analysis provides a scalable surveillance framework that may support the development of palliative care services, hospice infrastructure, and end-of-life monitoring in countries lacking comprehensive surveillance systems, including Pakistan.

Keywords: Malignant brain tumour; Palliative care; CDC WONDER

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